

# THE REVIEW

DEVOTED TO THE INTERESTS OF THE AMERICAN SOCIETY FOR METALS

Volume XIV

NOVEMBER, 1941

No. 9

## Manufacture of Shells Traced By Six Experts

Reported by H. T. Clark

Research Physicist, Jones & Laughlin Steel Corp.

Pittsburgh Chapter—"Shell Steel" was the topic of the opening meeting and was presented by a group of experts currently engaged in the production and fabrication of shell steel.

Guest of honor was Brig. General Burton O. Lewis, production chief in the U. S. Army Office of the Chief of Ordnance. He spoke briefly, complimenting the Chapter on the splendid cooperation with the Ordnance men.

The manufacture of shells involves the making of the steel, forging of the billets, and machining of the forgings. Lt. Col. J. L. Guion, executive officer, Pittsburgh Ordnance District, gave a description of the shells used by the Army and exhibited an array of specimens ranging from 30-caliber machine gun bullets to 155-mm. shells. He quoted some statistics on the muzzle velocities and vertical and horizontal ranges of the various projectiles.

### Technique in Shell Forging

"The Manufacture of Shell Steel" by C. M. Lichy, assistant metallurgist of the Pittsburgh Works, Jones & Laughlin Steel Corp., was a discussion of the grades of steel used, methods of steel making practiced, and the rolling procedure followed to produce the steel billets from which the shell forgings are made.

John Holmquist, director of research, Spang-Chalfant Division of National Supply Co., described the technique used in producing shell forgings from the steel billets. He gave details of production and inspection that had been worked out for the manufacture of satisfactory forgings and showed slides to illustrate his points.

The completed forging is the raw material for the machining operations which were described by D. W. Fletcher of the Christy Park Works, National Tube Co. He showed, by a series of cut-away blanks, the various steps in the machining of a 75-mm. shell.

The final speaker of the evening, Major J. S. Swauger of the Pittsburgh Ordnance District, explained the function of the Ordnance Department in the inspection of the shell. He pointed out that it is essential that every shell used be a perfect shell in order to produce

(Continued on page 3)

## Baltimore Chapter Meeting Is Group Trip to Show

Baltimore Chapter—A unique meeting was arranged when it was discovered that the first meeting of the year had inadvertently been scheduled for Oct. 20, the opening day of the National Metal Congress. The Chapter capitalized on its mistake by arranging a group trip to Philadelphia.

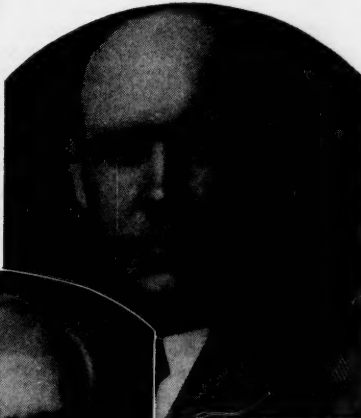
Two private cars were provided for the 135 men who registered for the trip. The train arrived in Philadelphia at 6:00 p. m., which gave the men the entire evening to see the show, returning at 11:46.

Were the ASM'ers whipped down? Not much! They immediately began inquiring about the possibility of going to the Detroit show next year!

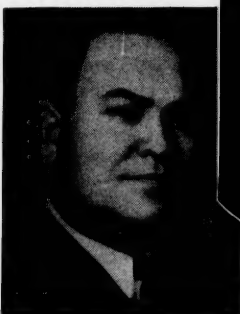
## New National Officers Elected at Convention



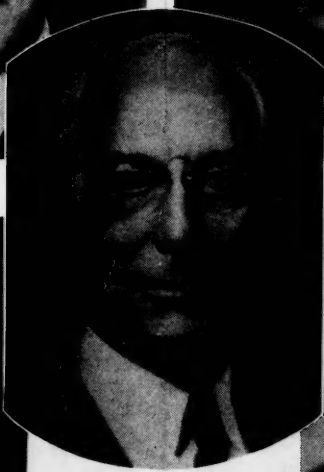
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N. F. Tisdale  
Trustee



Bradley Stoughton  
President  
American Society  
for Metals



K. R. Van Horn  
Trustee

New Officers and Two New Trustees Were Elected at the Annual Meeting of the American Society for Metals Held in Philadelphia Oct. 22. President Bradley Stoughton is dean emeritus, Lehigh University, and at present chief, Heat Treating Equipment Unit, Tools Section, Office of Production Management. H. J. French, elected to the vice-presidency, is in charge of alloy steel and iron development, International Nickel Co., and Treasurer Foley is superintendent of research, the Midvale Co. Norman F. Tisdale is metallurgist, Molybdenum Corp. of America, and Kent R. Van Horn is research metallurgist, Aluminum Co. of America. The Board of Trustees also includes W. H. Eisenman, secretary; Oscar E. Harder, past president; and E. L. Bartholomew and C. Y. Clayton.

## A. I. S. I. Secretary Shows Position of Steel Industry In Present Emergency

Reported by W. R. Smith

Lindberg Engineering Co.

Chicago Chapter—"Steel Mill Night" on Oct. 9 started with preliminary speeches by representatives of various steel companies in this area.

These included John Griffin, manager of Youngstown Sheet & Tube Co.; M. E. Getz, manager of Republic Steel Corp.; F. M. Gillies, manager of Inland Steel Co. (who before the evening was over were known as the three G-men); Walter E. Hadley, manager of operations for Carnegie-Illinois Steel Corp.; and L. B. Robertson, superintendent of the Wisconsin Steel Co. plant of the International Harvester Co.

After this appetizer came the treat of the evening. George S. Rose, secretary of the American Iron and Steel Institute, discussing "The Position of the Steel Industry in the Present Emergency", revealed many amazing facts.

He reported that in May 1940 the steel industry was operating at a rate of 60% of capacity, and production at that rate was equivalent to approximately 1,000,000 net tons of ingots per week. During most of the current year the industry has been working at close to 100% of capacity and at times actual

weekly production has exceeded 1,600,000 net tons.

Mr. Rose told of the possibilities for conservation of materials through standardization and simplification of specifications. Definite studies have been completed on the possibilities of conserving nickel, aluminum and manganese, and additional studies are under way with respect to the conservation of chromium and zinc.

The speaker reported the results of completed surveys and indicated what statistics are to be gathered in surveys estimating the needs for 1942.

After this kaleidoscopic view of the situation the meeting ended in a free-for-all question and answer period.

## Metal Show Scores Again

THE 23rd National Metal Congress and Exposition, held Oct. 20 to 24, overflowed all Philadelphia hotels with a registration of more than 40,000.

Not only the largest and most successful in history, its timely emphasis on problems of metal conservation and substitution, its theme of "new aids to production", and its thorough tie-in with the defense program made it an event of outstanding importance in the metal field.

A complete account of the meetings and activities is contained in the November issue of METAL PROGRESS.

## New Chapter Is Launched At Vancouver

The launching of a new chapter of the American Society for Metals, to be known as the British Columbia Chapter, took place at Vancouver, B. C., on Oct. 31.

The Puget Sound Chapter was represented by four members at this event, including Chairman Joseph Daniels, who was delegated by the National Office to install and organize the new group. He was assisted by Monte Parker, Frank W. Dearborn, and Gilbert S. Schaller.

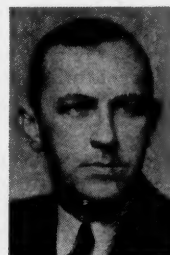
A gratifying turnout gathered at Brock Memorial Hall on the campus of the University of British Columbia, and approximately 85 men signified their intentions to affiliate. The following officers were unanimously elected:

Chairman—F. A. Forward, University of British Columbia.

Vice-Chairman—Wm. Mackay, Wilkinson Co., Ltd.

Secretary-Treasurer—J. R. Morris, Dendoff Springs, Ltd.

Executive Committee—Arthur Hill, F. E. Done, G. Goumeniouk, Robert McPhail, W. O. Scott, C. G. Hutton, (Continued on Page 4)



F. A. Forward



Compliments

To A.S.M. Howe Medalists Grossmann, Asimow and Urban (see page 7); also to Sauveur Achievement Medalist A. L. Marsh.

To Colonel Glen F. Jenks of the Ordnance Department, on his re-election as president of the American Welding Society; to A. G. Bissell, Bureau of Ships, Navy Department, on being elected a vice-president for the middle eastern district, A.W.S., and to N. F. Ward, associate professor of mechanical engineering, University of California, vice-president for the Pacific Coast district; to Frank B. Bolte, process standards engineer, Boeing Aircraft Co., Seattle, on his election as a director at large.

To Robert H. Aborn, United States Steel Corp. Research Laboratory, on the award of the Lincoln Gold Medal of the American Welding Society.

To C. H. Mathewson, head of the department of metallurgy at Yale University, Honored by the Yale metallurgical alumni at a dinner commemorating his 60th birthday.

To C. W. Heppenstall, president, Heppenstall Co., Pittsburgh, on his donation of a modern X-ray machine to the borough of Rotherham, England, where the Heppenstall family has been in the steel business for 150 years.

## THE REVIEW

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RAY T. BAYLESS.....*Editor*  
M. R. HYSLOP.....*Managing Editor*

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### Lecture on Plastics Reviews Production, Cost and Properties

Reported by James W. Poynter

Asst. Met., Army Air Corps, Wright Field

Dayton Chapter—The meeting on Oct. 8 included two excellent features. The coffee talk on "Propaganda" was given by Michael Bradshaw of the Dayton Herald. The newer techniques were described and a part of the ton of propaganda received by the Herald was exhibited and analyzed.

J. C. Pitzer, research engineer of the Formica Insulation Company, presented the technical feature "Plastics". The production of plastics, described as "the glamour girl of the chemical industry", was 250 million pounds in 1940 but this amounted to only 0.33% of the iron and steel production.

The average cost of plastics is 30¢ per lb. while special molded shapes may cost \$2.00 per lb.

Not Serviceable Above 350° F.

Plastics have tensile strengths ranging from 4,000 to 30,000 psi.; compressive strengths of 10,000 to 36,000 psi.; notched bar impact strengths of 0.2 to 10 ft.-lb., and weigh about 1/6 as much as steel.

Plastics are not malleable and in general are not serviceable at temperatures above 350° F.

Phenolic laminated plastics are made by dissolving a phenolic resin in a suitable solvent, such as alcohol. Paper or cotton fabric is saturated with this solution and the solvent dried out to leave the resin impregnated into the paper or fabric.

560 Laminations in Gear Blank

Laminated sheets are made by superimposing layers of the paper or fabric to a desired thickness. This thickness may range from 1/4 in. to 8 in.

An 8-in. sheet which may be used as a gear blank is made up of approximately 560 laminations of cloth. Sheets are made in sizes up to 48x96 in.

Molded plastic materials are made by milling phenolic resins with shredded fabric or wood flour. The dry mixture is then ground to a desired fineness. The resultant powder is used in a mold to produce forms which may be required.

Two examples of "plastic propaganda" were given. One, the so-called plastic airplane, is 10% plastics and 90% wood; the other, the plastic automobile, may be the car of the future.

### High Strength Steels Related to Defense By A. F. Stuebing

Reported by Gerald M. Cover

Assoc. Prof. of Met., Case School of Applied Science

Cleveland Chapter—At the Nov. 3rd meeting, in place of the usual coffee talk, Kent R. Van Horn showed his colored movies of the annual outing last June. They were followed by a showing of the moving picture "USS Cor-Ten" dealing with the development and application of high tensile steel.

The monthly speaker was A. F. Stuebing, development engineer, Carnegie-Illinois Steel Corp., who spoke on "Low Alloy, High Strength Steels".

Recent years have shown many developments in these steels, for one with good corrosion resistance and good welding quality to be used in the as-rolled condition was much needed. In the past, higher carbon content in the plain carbon steels for improving tensile properties often resulted adversely otherwise.

Cor-Ten steel was discussed at length; its copper and chromium, low carbon and 0.10% or more of phosphorus give improved corrosion resistance and strength. The ratio of elastic limit to ultimate strength is high, similar to the heat treated steels.

Illustrations were given of weight savings by use of these steels. Slower speeds in forming are necessary, however. The welding properties are excellent and the speaker stated that failures of welds, even in freight cars subject to severe shocks, are almost unknown.

The most extensive application is in transportation—busses, trucks, mining and material handling equipment.

### Two Meetings Cover Steel Substitutes, Strategic Metal

Reported by David F. Carter

Asst. Met., Diamond Chain & Mfg. Co.

Indianapolis Chapter—All attendance records for a regular meeting were broken on Oct. 13 when 130 members heard Harry W. McQuaid of Republic Steel Corp. and more recently of O.P.M. His subject was "Steel Substitutions—Selection and Heat Treatment".

A detailed report of Mr. McQuaid's talk is given on page 4.

At the September meeting, E. E. Thum, editor of METAL PROGRESS, spoke on "Strategic Materials". This talk was similar to that presented before the Canton-Massillon Chapter last spring except that it was brought up to date with the latest developments in the metal situation.

### Describes Metallurgical Control at Deere & Co.

Reported by V. C. Leatherby

Eclipse Fuel Engineering Co.

Rockford Chapter—On Wednesday evening, Oct. 29, at the Elks' Club, H. Bornstein, director of research, Deere and Co., Moline, Ill., discussed "Metallurgical Control", using examples of practices and controls used at the Deere factories.

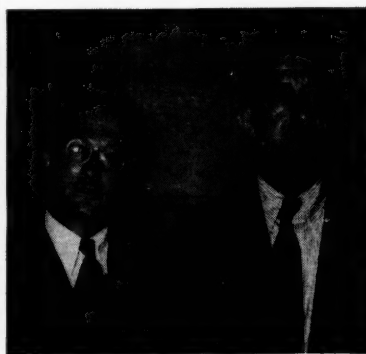
He explained how they developed specifications for raw materials, process control, and personnel. During the discussion that followed, Mr. Bornstein explained how his department was continually working with possible substitutes that could be used during the present emergency.

Preceding the principal talk, Lowell Spurgeon, former football captain at the University of Illinois and now assistant principal at East High School of Rockford, related a few of his interesting experiences in athletics.

### Arnold Points Out How Inspection Service Can Assist Bidders on Navy Contracts

L. A. Chairman and Speaker

Reported by J. A. Monax  
Natural Gas Equipment, Inc.



Los Angeles Chapter Chairman B. H. Brown (Left) and Lieut. Commander J. C. Arnold, Guest Speaker at the Meeting Held on September 25.

### Forging Primarily a War Industry; Gives Strength, Reliability

Reported by E. H. Broadhurst

Inspector, Universal-Cyclops Steel Co.

Northwestern Pennsylvania Chapter—With the worthy assistance of Ray T. Bayless, assistant secretary of the National Society, and supported by Waldemar Naujoks, chief engineer of Steel Improvement and Forge Co., as guest speaker, the Chapter invaded a new corner of its territory at Erie on Oct. 9.

Beginning with primitive methods of forging, Mr. Naujoks traced the history and development of forging hammers and presses up to the most modern machines. From the earliest water-powered drop hammer to the most recent forging machine, forging has been primarily a war industry. Shields, swords, and armor were the beginning of what is today a major industry—shell and gun forging.

Vary From Ounces to Tons

Forgings vary from 1/4 oz. up to many tons and involve innumerable techniques, which require a lifetime of study and work to acquire. Nearly all aspects of metallurgical knowledge are involved in this industry where type of steel for both forgings and dies, physical properties, heat treatment, internal flow pattern and final structure are all necessary considerations.

Mr. Naujoks closed with the theme that forging means strength and reliability and that they are trying to keep these thoughts in the industry today while doing their bit for national defense.

The discussion following the lecture was ably conducted by J. J. White, chief metallurgist of Erie Forge and Steel Co.

Cracks, Stress Relief Discussed

H. McMahon of Struthers-Wells Titusville Corp. asked whether cracks visible in finished forgings are usually shrinking cracks or whether they are due to fiber rupture during forging.

The speaker replied that many times minute cracks in the die will cause starting points for cracks or perhaps the outer skin of the forging has actually been ruptured. There is no general cause for the cracks but they may be from many sources.

Mr. Jacobson of National Erie Corp. asked if stress relieving is necessary for forgings and was told that it is best to stress relieve anything that has been forged to insure best results with minimum danger of warping and cracking during heat treatment.

Los Angeles Chapter—The first meeting of the season was held on Sept. 25, with Lieut. Commander J. C. Arnold, senior assistant in the U. S. Naval Inspection Office at Vernon, Calif., as the guest speaker. A record turnout of 315 heard him speak on "Inspection of Naval Materials".

Lieut. Commander Arnold pointed out that the Naval inspection service is one of the oldest of the Federal services, originating during the first Naval ship-building programs in 1794.

The Naval Inspector's Service, although primarily set up to safeguard the interests of the Navy, can also be of considerable assistance to the manufacturer who holds a Naval contract. The Inspector's Office follows a contract through from the time the order is placed until the completion and delivery of the material.

The Commander suggested that prospective as well as successful bidders on Navy contracts should become familiar with purchasing and inspection procedure described in a bulletin issued by the Navy Department entitled "General Specifications for Inspection of Material".

The bidder should be thoroughly familiar with all the provisions and conditions of the proposed contract, since when the contract is once awarded both the successful bidder and the Naval Inspector must follow the specifications.

The Naval Inspector's task is an exacting one and must be performed honestly and without favor.

Navy specifications are the result of actual operating conditions and are frequently changed as experience and usage dictate. Naval vessels must be built to withstand punishment not encountered in commercial practice.

Correct procedure should be followed in shipping as well as invoicing any government contract. When any questions arise, Lieut. Commander Arnold pointed out, the inspection service personnel is at the manufacturer's service to supply the proper and correct answers.

### Engineer's Conception of Stiffness & Strain Defined

Reported by Amos D. McGary

Metallurgist, McKay Co.

York Chapter—W. J. Diederichs of the Autocar Co., Ardmore, Pa., began his talk at the meeting on Sept. 24 by defining and discussing some of the fundamentals of the different types of static loads.

Among some of the misunderstood terms most commonly used by the shop mechanic and the engineer are *stiffness* and *strain*. The poet, O. W. Holmes, was quoted to portray good English, yet poor understanding when the same terms are applied to the vocabulary of shop usage.

Deformation was used instead of strain as a more universally understood term.

A number of blackboard diagrams and sketches were used to illustrate what takes place within a specimen or a part of a machine when subjected to the various types of static loads.

Mr. Diederichs covered his subject clearly and concisely, answering and discussing many questions.

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## Hardenability Tests Simplify Specifications

Reported by G. L. White  
Editor, Canadian Metals and Metallurgical Industries

Ontario Chapter—Opportunities for simplification of specifications were described by W. E. Jominy of the Chrysler Corp. in his address on "Hardenability Tests and Their Commercial Application" before the Chapter in Toronto on Oct. 10.

Mr. Jominy was introduced by Harold Chambers, metallurgist, Atlas Steels, Ltd. Chairman Thomasson introduced a prominent guest in the person of F. R. Barnsley, past chairman of the Montreal Chapter.

The entertainment feature was a film on "Diamond Cutting" at Baumgold Brothers, New York, presented through the courtesy of Birks, Henry and Sons, Ltd., Hamilton, Ont.

### Practical Applications Raise Problems

It is not difficult to develop a hardenability test which will give a relationship between cooling rate and hardness in steel. But some interesting problems are involved in securing methods applicable to various sections and types of steel and providing results for practical commercial application.

It has been found that any laboratory can attain quite accurate checks on hardenability tests but it is more difficult to obtain good checks between one laboratory and another. Probably slight differences in methods exist which can only be straightened out through consultation.

In commercial applications it is generally possible to pick out a steel for a certain job from the hardenability curve.

### Test Used Before Rolling

Some steel mills are using the hardenability tests on their steel before rolling, thus detecting if the steel is not adapted to the purpose for which it is to be processed.

The question of the extent to which chemical analysis should be waived and judgment in steel selection rested upon hardenability tests is a matter for careful consideration. It is necessary to watch the phosphorus in the steel in order to retain proper impact strength and the variations in carbon should not be too wide. However, it is true that chemical specifications can be opened up considerably if hardenability is kept under control.

It is hoped that through more extensive application of hardenability tests, steels may be manufactured at lower cost to meet requirements in many applications.

## Editor's Talk on Strategic Metals Draws Overflow

Reported by F. N. Meyer  
Technical Supervisor, Waterbury Branch  
American Brass Co.

New Haven Chapter—So large an audience was attracted to the meeting on Oct. 16 that the regular Hammond Laboratory Lecture Hall proved to be inadequate, and the meeting was therefore moved to Strathcona Hall, Yale University.

The important and timely subject of this meeting was "Strategic Metals and Substitutes" and the speaker Ernest E. Thum, editor of METAL PROGRESS.

Mr. Thum's remarks essentially summarized the information contained in the series of articles on strategic metals which have been running in METAL PROGRESS in recent months.

## New Yorkers Revel at Annual Season-Opening Party



R. W. Moore, Retiring Chairman, New York Chapter, Receives a Certificate of Honor from R. G. Humphrey, Newly Elected Chairman, at the Opening Party.



J. A. Scheick Draws from the Lottery Box While A. Gobus, Co-Chairman of the Smoker Committee, waits by the Microphone to Announce the Winning Numbers.

## Demise of 18-4-1 No Longer Mourned in R. I.

Reported by Walter M. Saunders, Jr.  
Consulting Chemist and Metallurgist

Rhode Island Chapter—After listening to L. S. Bergen, associate director of metallurgy and research, Crucible Steel Co. of America, talk on "Molybdenum High Speed Steels", one of the most ardent 18-4-1 members of the Chapter was heard to remark that he "didn't think he would have any trouble using these new-fangled alloys".

In view of the fact that many of the 150 members and guests at the opening meeting of the year on Oct. 1, had been bothered by similar misgivings, the subject was timely, and extremely helpful in dispelling the gloom occasioned by the partial departure from the scene of the old and trusted friends, tungsten high speed steels.

Mr. Bergen's talk is reported in detail on page 6.

## Detroiters Make Annual Trip to Football Game

Reported by Walter G. Patton  
Climax Molybdenum Co.

Detroit Chapter—The annual trip to Ann Arbor was made on Sept. 27. Wives and friends are always welcome on this occasion and about 400 persons accepted the Chapter's invitation to sit on the 40-yard line and watch Michigan take the gridiron contest from Michigan State to the tune of 19-7.

Dinner was served to about 150 guests at the Michigan Union following the game. Prof. A. E. White, chairman of the Department of Chemical and Metallurgical Engineering of the University of Michigan, introduced the principal speaker of the evening, Prof. Heber D. Curtis, of the Astronomy Department, whose talk, "Storms on the Sun", was illustrated with moving pictures which have become justly famed.

Thanks are due to Prof. W. A. Spindler and his Ann Arbor Committee for arranging another highly successful meeting and to the Detroit Committee under V. A. Crosby which handled the ticket distribution.

## Manufacture of Shell Traced

(Continued from page 1)

fect the man operating the gun and to insure its effectiveness.

H. A. Moorhead, manager of bar and semi-finished materials bureau, Metallurgical Division, Carnegie-Illinois Steel Corp., was an able discussion leader. The program owed much of its effectiveness to his efforts.

## 400 Gather for Good Fellowship and Fun; Prizes, Dinner and Floor Show Featured

Reported by Ellis Blade  
Consulting Engineer

New York Chapter went into action with a bang on Oct. 3, when 400 hard-working members of the metal profession convened at the annual season-opening party for a round of good-fellowship, rollicking fun, and relaxation.

The crowd was officially ushered in to dinner to the familiar strains of a popular five-piece orchestra. Each member and guest received a bag full of souvenirs and favors as he entered the dining room.

When the soup course was well along, distribution of the gate drawings was

begun. The prizes ranged from fountain pens to precision radios; from manicure sets to men's hats; and last but by no means least were 17 cash awards of \$5 and \$10 each.

This phase of the program was climaxed and brought to a close by the award of a handsome certificate of appreciation to the Chapter's popular last year's chairman, Dr. R. W. Moore, in recognition of his devoted services.

At the magic hour of nine came the much-heralded floor-show. The next two hours were packed with entertainment of the most varied sort, including novelty dances, specialty numbers, a magician who discovered live chicks in the pockets of the audience, a banjo and guitar expert, and a tumbling act, with monologue and stories sandwiched in between.

At eleven came the end of one of the most successful get-togethers New York Chapter has had in many years.

## Advantages of Gas Carburizing Shown

Reported by R. A. Shattuck  
Metallurgist, Crucible Steel Co. of America

Syracuse Chapter—Harry W. McQuaid, assistant chief metallurgist of Republic Steel Corp., and consultant for the O.P.M., talked on Oct. 7 on "Gas Carburizing and Nitriding".

After explaining that the primary purpose of casing is to combine the machinability of the low carbon steels and the wear resistance of tool steel, Mr. McQuaid had slides to point out the function of the added carbon in forming very hard iron carbide envelopes around the individual grains in the case.

Maximum hardness of Rockwell C-65 to 67 is obtained with as little as 0.60% carbon, but the wear resistance increases with higher concentrations.

Uniformity throughout the case is essential, and the depth and concentration of carbon are controlled by both time and temperature. At low temperatures the diffusion is slow and a case with a very high carbon content is built up along the extreme edge of the work.

At higher temperatures the diffusion is much faster resulting in an increased case depth and a more uniform diffusion. The speaker advocates temperatures as high as 1800° F. on some types of commercial work.

Some of the advantages of gas over box carburizing were stated as (a) better control over diffusion, and (b) the time saved in production work by the elimination of the highly insulating compounds.

With regard to nitriding, it was shown that the work must be quenched and tempered prior to nitriding to prevent the dispersion of iron nitride, and consequent embrittlement.

## Combined Officers and Educational Night Opens Season at Philadelphia

Reported by Joseph Missimer  
Salesman, L. Norris Hall, Inc.

Philadelphia Chapter—The first meeting of the year, a combination National Officers' Night and Educational Night, was held on Sept. 26 at Temple University, home of Philadelphia ASM's school of physical metallurgy.

Horace Knerr, director of the course, and Joseph G. Jackson, chairman of the Educational Committee, told of the plans for this, the 21st year of the school. Mr. Jackson announced that the special lecture course would be given in November and would cover "Substitute Materials".

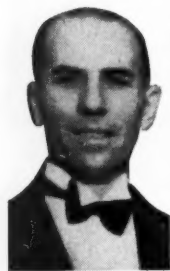
Guests for the evening were Prof. Bradley Stoughton, then vice-president of the national society, and Bill Eisenman, its secretary. Mr. Eisenman told of the plans for the National Metal Congress to be held in Philadelphia the week of Oct. 20th.

Professor Stoughton, speaker of the evening, had as his subject "The Defense Problem in Relation to Metallurgy". It centered around the scarcity of some types of metals.

Professor Stoughton left no room for doubt that non-defense industries will have to make sacrifices as the defense program is stepped up. The OPM, for which Professor Stoughton is one of the consultants, has adopted as its slogan—"Don't let them catch you with your plants down".

## Vice-Chairman N. Y. Chapter Dies Suddenly

HUGH MENIHAN, active committee man and genial vice-chairman of the New York Chapter, died at the age of 45 of a heart attack in Baltimore, Md., on Monday, Oct. 20. Associated with the American Bank Note Co. for 22 years, he was superintendent of the plate-making department since 1926.



Hugh Menihan

On his last day he had attended the A.S.M. convention in Philadelphia, and in the evening had journeyed to Baltimore to visit friends and relatives. He was stricken soon after his arrival, and death followed shortly afterward.

Menihan, known to his friends and associates as "Hugh", was born on an Oklahoma farm in 1896. At 18 he joined the U. S. Navy as an apprentice machinist, later receiving a first-class rating, and going overseas.

After the war he entered the employ of the American Bank Note Co. as a mechanic. From machine operator he became head of his division, and had a bright future for further advancement.

Through an associate he learned of the American Society for Metals, which he joined in 1936. Quickly taking part in committee work, he became recognized as one of the leaders of the Chapter. He was elected to the Executive Committee in 1938, '39, and '40, was annual smoker chairman in 1940, and Chapter vice-chairman in 1941.

New York Chapter deeply mourns the loss of one of its most popular members.

H. R. TREADWELL  
Vice-President, American Bank Note Co.

### Ernest B. Drake

DETROIT Chapter lost one of its most active members recently. Professor ERNEST B. DRAKE, head of the Department of Metallurgy of Wayne University, died suddenly on Oct. 23rd of a heart attack. He was ill only a few hours and his passing comes as a great shock to his legion of friends in the Detroit area.

Professor Drake was a past-chairman of the Detroit Chapter and served with outstanding enthusiasm as a member of many committees of the local chapter. He was also active in the national organization of A.S.M.

WALTER G. PATTON  
Climax Molybdenum Co.

### Paul F. Reichhelm

PAUL F. REICHELHELM, president of the American Swiss File & Tool Co. of Elizabeth, N. J., died on Oct. 3, 1941, after a long illness.

Mr. Reichhelm had been associated with the company ever since it was founded by his father, E. P. Reichhelm, in 1900, and succeeded his father as president in 1916.

Mr. Reichhelm built up his company to the position of the largest exclusive manufacturer of Swiss-pattern files in the United States, and he was widely known among distributors and users of these precision files. He developed many special processes for improving the



E. B. Drake

## Metallurgical Primer Revised—McQuaid Tells How to Get Along Without Alloys

Reported by Verner Lindstrom  
Chemist, J. H. Williams & Co.

*C stands for CARBON which in different amounts  
Alters the height of the scleroscope's bounce.*

*Mn is MANGANESE which when balanced with C  
Makes up a pretty good steel recipe.*

*Mo is for MOLY; we still have this pal,  
And for shifting the S-curve she's really the gal.*

Buffalo Chapter—If metallurgists without priorities know of any other alloying elements they may as well forget them. But fortunately, as Harry W. McQuaid of Republic Steel Corp. told a full house at the October meeting, they can get along without them very well. Mr. McQuaid discussed "Substitute Steels".

Except for cutting tools, corrosion resisting alloys and special applications like the use of 52100 steel for ball bearings, the elements chromium and nickel can be dispensed with. For there are remarkable and adequate properties inherent in the simplest kinds of steels.

### Correct Design Important

First of all the metallurgist should insist upon correct and sensible design with generous fillets, pads, smooth surfaces, and large diameters for threads. A thing as simple and apparently innocuous as an inspector's stamp may be the focus for stresses which can cause the breakdown of an otherwise perfect forging.

Second, he must come to recognize that there are other things in steel besides analysis, the most important of which is structure. Chemically, his concern should be with carbon and manganese, plus molybdenum for hardenability control, and possibly with boron, titanium and tellurium which offer new fields for development. Physically, he must consider what properties are needed in the final product.

### Three Factors Determine Choice

Mr. McQuaid believes that the choice of steel should be determined by three things: Hardenability desired, structure wanted, and a knowledge of the S-curve.

Hardenability is a factor of the carbon content which can be predetermined, as for example, by means of the Jominy test. Structure influences hardenability, and in the case of resistance to impact it is the governing factor.

The S-curve is the third vital factor. To get the most out of a steel requires skillful time-temperature treatment. A fast quench in the initial stage is needed to keep the cooling curve to the left of the upper line of the nose of the S-curve. Once below the nose of the S-curve, the slowest cooling rate should obtain to minimize the stresses produced by drastic quenching.

A newcomer in deep-hardening alloys is boron which when used in quanti-

ties less than 0.010% has the beneficial effect of moving the S-curve to the right, thus preventing early intersection with the cooling curve in slower quenches.

### Manganese Steel Useful

Many manufacturers, particularly in the automotive field, already do well with straight carbon-manganese and manganese-molybdenum steels. Transmission gears and drive shafts are among their successful applications of manganese steels.

If the metallurgist in his search for a way out of the priorities problem gets as far as Mr. McQuaid thinks he should, he may find himself in the odd position of discarding expensive alloy steels for good—not because they ever were any better but merely because their chief value was in their ease of handling.

At any rate the problem of substitutes is here. There is material enough at hand to work with, but the metallurgist "must git up and do something".

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## Practical Instance Given of Production Using Moly Steels

Reported by J. T. Ballard  
Quaker Chemical Products Corp.

Hartford Chapter—With priorities and shortages holding high in the minds of industry, three men well known in the field of molybdenum steels were invited to talk to Connecticut industry on Sept. 9 on "Molybdenum High Speed Steels, Their Heat Treatment and Uses".

F. Lloyd Woodside of the Climax Molybdenum Co. was the first speaker and gave the chemical and physical properties of the three best known types of molybdenum steels. His talk included data on heat treatment, forging and the use of coatings, and special information on the use of these steels for tool work.

Norman I. Stotz of the Universal-Cyclops Steel Co. then picked up the story of molybdenum steels where Mr. Woodside left off, giving their practical characteristics and citing proper choice for the specific job at hand.

The third speaker of the evening was none other than New Haven's own Charles Hammond, recently of the Winchester Repeating Arms Co., now assistant to the president of the A. F. Holden Co. Charlie brought out the fact that molybdenum high speed steels not only can be used successfully for tools, but also that Winchester has been using practically nothing but these high speed steels for some years. He stated that certain nitrided barrel drills made of molybdenum steel showed increased production of 50 to 100% in the barrel department.

The last of the evening was given over to a vigorous question period.

## Robbins Speaks at Tri-City

Reported by James C. Erickson  
Deere and Co.

Tri-City Chapter—Fred J. Robbins, metallurgical engineer, Bliss and Laughlin, Inc., Harvey, Ill., opened the new season by an exceptionally interesting address entitled "Cold-Drawn Steels and Stress Relieving" at the Sept. 9th meeting held at Rock Island, Ill. Mr. Robbins' talk is reported in detail on page 5.

As an added feature, Gordon T. Williams, metallurgist of Deere & Company, Moline, Ill., presented a coffee talk entitled "Molybdenum Vs. Tungsten High Speed Steels".



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## Strain Temper Improves Cold Drawn Steels

Reported by H. E. Hostetter  
Metallurgical Engineer, Climax Molybdenum Co.

St. Louis Chapter—The regular meeting on Oct. 17 featured F. J. Robbins, metallurgical engineer, Bliss & Laughlin, Inc., Harvey, Ill., on the subject, "Strain Tempering and Cold-Drawn Steels". Mr. Robbins was singularly successful in correlating considerable technical data with various commercial considerations.

Strain tempering, or strain annealing, is a thermal process applied to cold-worked steel at sub-critical temperatures, usually in the range 300 to 1200° F. In general, strain tempering at the lower temperatures effects an increase in the tensile strength and yield point with but slight increase in the elongation and reduction of area as compared with the properties of the cold-drawn steel prior to the thermal treatment. With higher strain tempering temperatures the tensile strength properties are decreased, while the ductility is increased materially.

### Strength Ratios Raised

One of the most important effects of strain tempering is in raising the proportional strength-tensile strength ratio and the yield point-tensile strength ratio. For example, S.A.E. X1335 being used for certain fuse parts must meet specified physical properties of 120,000 psi. tensile strength, 65,000 psi. proportional limit, 16% elongation, 40% reduction of area.

The processing requires quenching, tempering and machine straightening. This last operation lowers the proportional limit below the required 65,000 psi.; however, a strain temper at 750° F. increases the proportional limit sufficiently to meet the specification.

Steel bars are cold drawn to obtain one or more of the following desirable qualities: (a) Close size tolerances, (b) good surface finish, (c) improvement in physical properties, (d) good machinability.

### Surface Quality Good

Obviously only the minimum amount of material need be removed during machining operations. The quality of the cold-drawn surface oftentimes is satisfactory for finish requirements for those portions that require no machining to size.

Hardness traverses across the diameters of cold-drawn bars reveal that heavier drafts dissipate differences in

## C. E. Weinland Is Speaker at Golden Gate



At the Speakers' Table, September Meeting of the Golden Gate Chapter, are Left to Right, H. E. Krayenbuhl, Secretary of the Chapter; John Parks, Chairman; C. E. Weinland of Johns-Manville Corp., Principal Speaker; and Victor P. Beauchamp, Chairman of the Program Committee. The inset shows Mr. Weinland as he addressed the meeting on "Heat Flow and Its Control".

surface and center hardness found in bars given light drafts. Using a constant draft and varying the temperature of strain tempering it is found that maximums occur in the curves for tensile strength, yield point and proportional limit.

In summation Mr. Robbins gave an impartial appraisal of the field of usefulness for cold-drawn and strain-tempered steel, stating that practical maximums are 2 in. diameter, 125,000 psi. tensile strength, 100,000 psi. yield point and 269 Brinell.

Lt.-Col. W. Carter Bliss of the St. Louis Office of Production Management spoke on "Organization of the Division of Contract Distribution, O.P.M." in a coffee talk.

## Magnaflux Tests Parts From Largest to Smallest

Reported by E. J. McKnight  
Griffin Wheel Co.

Rocky Mountain Group—F. B. Doane, vice-president of Magnaflux Corp., discussed the use of Magnaflux inspection at the first meeting of the season.

Mr. Doane began by outlining the historical discovery by Major Hoke and development by Professor deForest.

Materials to be tested, for the most part, determine the type of equipment to be used, and parts from the largest to the smallest are thus tested. As the tested article is in effect turned into a magnet, non-ferrous and austenitic steels, of course, are excluded.

Magnaflux will detect external and internal defects by deflection of the flux. Both a.c. and d.c. currents are used, d.c. giving better penetration. Wet and dry methods are used, each giving satisfaction under conditions calling for their use.

Mr. Doane stated that while detection of defects for the sake of eliminating the defect is important, changes in design indicated by this method result in elimination of the cause.

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## Proper Control Prevents Scale, Decarburization

Reported by James C. Erickson  
Deere and Co.

Tri-City Chapter—"Controlled Atmospheres for Heat Treating Steel" was the subject of an interesting address given by Norbert K. Koebel, director of research, Lindberg Engineering Co., Chicago, at the Oct. 14 meeting held at Rock Island, Ill.

The evils of uncontrolled atmospheres in the heat treating of steels may be listed as (a) scale (b) decarburization, and (c) carburization.

Scale reduces the size of the original part, causes surface blemishes, and decreases the efficiency of the quenching medium.

Decarburization decreases the surface hardness of parts, as well as reduces their strength. On some types of tools, carburization may be as bad as decarburization in causing tool failures, low production runs, and high tool repair costs. Carburization leads to early failures by causing fatigue cracks and chipping.

With the aid of lantern slides Mr. Koebel described and discussed the various types of equipment for controlled atmosphere generation, including the endothermic reaction generators and the charcoal type generators.

### Atmospheres for Mo Steels

With the government priorities causing a greater use of high speed molybdenum tool steels, controlled atmosphere is gaining added importance. The common uncontrolled heat treating atmosphere produces a molybdenum oxide on molybdenum high speed tool steels in the same manner that oxides of tungsten are produced on the 18-4-1 type. The molybdenum oxide, unlike that of tungsten, is volatile at high temperatures, thus leaving unprotected metal which is readily decarburized.

A simple method of controlling the atmospheres when heat treating the molybdenum high speed steels is to heat charcoal with the steel. The most reliable method, however, is to use a charcoal gas generator.

The address was preceded by a dinner and a motion picture of the New England hurricane of 1938, entitled "Uncontrolled Atmosphere".

## Movie Illustrates Heat and Its Control

Reported by W. B. Kennedy  
Metallurgist, Columbia Steel Co.

Golden Gate Chapter—The first dinner meeting of the fall season was held on Sept. 15 at the Engineers Club. The Chapter's ever-faithful movie operator, Fred Schwarting of Caterpillar Tractor Co., showed the sound picture, "Men of the Coast Guard".

In spite of San Francisco's marine location, there were many native sons who got a new idea of the numerous duties of the Coast Guard and the many services that are rendered by this little publicized agency of our Government.

The main subject of the evening was presented by C. E. Weinland of Johns-Manville Corp., whose remarks were very effectively supplemented by a talking moving picture entitled, "Heat and Its Control". This picture covered the production of insulating materials and their application to a wide range of uses.

In addition to some very informative scenes showing research methods and process control practices, the picture had many action sketches that cleverly illustrated some of the fundamental principles of heat flow.

## ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ FOR AMERICA'S DEFENSE INSPECTORS A NEW LOW-PRICED GUIDE BOOK INSPECTION OF METALS

by Harry B. Pulsifer, Metallurgical Engineer, American Metal Treating Co., and Consulting Metallurgist, Ferry Cap and Set Screw Co., Cleveland, Ohio.

To help speed inspection of metals used in national defense, the American Society for Metals is making available at cost this new, authoritative 180-page book on metal inspection. Written in non-technical language by an authority in the field, "Inspection of Metals" is designed particularly for those with a limited knowledge of metal-making practice and the testing of metals.

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## Grimshaw and Kells Are York Chapter Speakers

Reported by Amos D. McGary  
Metallurgist, McKay Co.

York Chapter—Upon the recommendation of the national headquarters A.S.M. in cooperation with O.P.M., a special meeting was held on Oct. 16 to acquaint the Chapter members with molybdenum high speed steels.

Speakers were L. C. Grimshaw and Ray P. Kells of the Latrobe Electric Steel Co., Latrobe, Pa. Mr. Grimshaw opened the talk with a brief history of molybdenum steels and the reasons for displacing tungsten with molybdenum in high speed steels.

Mr. Kells showed a number of slides showing the effects of underheating and overheating and the proper hardening temperatures, and their effect on grain size. The talks presented by Messrs. Grimshaw and Kells have been reported when presented before other Chapters of the Society.

## Alloying Elements 'Rated' for Specific Services

### System of Determining "Merit Ratings" Based on 35 Common Properties

Reported by Fred P. Peters  
Associate Editor, Metals and Alloys

New Jersey Chapter—Conservation of alloying elements is such an important matter today that metallurgists and engineers are vitally interested in making the "minimum" alloy do the maximum job wherever possible.

What may be a useful step in this direction is a system of "rating" alloying elements. Such a system was described at the Sept. 15th meeting by John Mitchell, alloy metallurgical engineer of Carnegie-Illinois Steel Corp., Pittsburgh, in his talk on "Selection and Conservation of Alloying Elements Used in Steel".

Mr. Mitchell presented a comprehensive tabulation of alloying elements and their individual "merit ratings" with respect to about 35 properties which ordinarily dictate the selection of medium and low alloy steels.

Rating numbers proposed by Mr. Mitchell vary from 0 to +10 where the element favors improvement of a property, and from 0 to -10 where use of the element is detrimental to the property desired.

#### Suffix Letters Indicate Quantities

Of equal importance are the suffix letters which Mr. Mitchell uses to modify the merit rating numbers. These letters indicate the characteristic influence of the added element.

Thus, when the influence of the element appears to be approximately proportional in intensity to the amounts present, a linear function is assumed to exist and the suffix letter "P" assigned.

Where elements function with relatively greater intensity at low concentrations, the letter "S" indicates that small amounts are most effective. "L" indicates that large quantities of an element are essential for best results, and "I" indicates that intermediate quantities are most effective.

Thus, in the plan suggested by Mr.

Mitchell, the numbers indicate the degree of favorable or unfavorable effect, while the suffix letters show the approximate quantities of the element which are required for best results.

#### Merit Ratings Added

Carbon and manganese, for example, have high plus values for abrasion resistance, molybdenum for creep, and nickel for low-temperature toughness. Silicon in large quantities has a high minus value for depth of carburized case, sulphur for hot workability, and phosphorus for toughness at low temperatures.

The actual merit ratings, combining numerical values and suffix letters, are assigned by Mr. Mitchell on the basis of experience, published work and special tests.

In using the proposed system, the engineer decides what set of properties are required for the application in mind. For example, a combination of hardenability, corrosion resistance, heat treated toughness, toughness at low temperature, and weldability might be necessary for a certain part.

By algebraically adding the merit rating numbers, it will be seen at a glance whether the over-all effect of an element is favorable or unfavorable. The suffix letters in turn clearly indicate the relative quantities of the elements required to secure the desired property.

In the coffee talk before the technical meeting, A. W. Deller, International Nickel Co. patent attorney, presented some mirth-provoking examples of curious, quaint (and sometimes quite wonderful) inventions for which patents have been sought.

### Students Describe Steel Mills

Reported by Irving Levinson  
Student, Michigan College of Mining and Technology

Michigan College of Mining and Technology Group—The first of a series of talks entitled "Steel Mill Operations" was given at the first business meeting of the school year.

Clair Donovan and Henry Hanson, senior metallurgy students who spent the past summer at the Gary Sheet and Plate Mill of the Carnegie-Illinois Steel Corp., discussed the rolling, plating, and testing of the products of the mills. Specimens were passed around and various plant problems were discussed.

### Young Fellows' Night Is Open Meeting in Chicago

Reported by Milton C. Kester  
Testing Engineer, International Harvester Co.

Chicago Chapter—The first meeting of the season, held Sept. 11 in the beautiful main dining-room of the Chicago Bar Association, was guest night for the "Young Fellows" interested in metallurgy.

Chairman W. D. McMillan, who presided over the meeting, followed his welcoming address by introducing the Executive Committee for the new year.

Following the welcoming of Professor Scott and his group of metallurgical students from the University of Minnesota, F. J. Robbins gave a preview of the coming educational series.

Arch Ward, sports editor of the Chicago Tribune, gave a talk on the value of college competitive sports, and Ulmer Turner, WENR and NBC "Globe Trotter", followed with a speech covering "Our National Protection".

The grand climax to the start of an unusually successful opening season was the broadcast of President Roosevelt's speech of that date.



John Mitchell of Carnegie-Illinois Steel Corp. Addressing the New Jersey Chapter (Photo by W. L. Hulst)

### Board of 4 Experts Stimulates Discussion On Moly High Speed

Reported by Paul Ffield

Materials Engineer, Bethlehem Shipbuilding Corp.

Boston Chapter—The first meeting of the season was held at M.I.T. on Oct. 3. After dinner Lieut. G. M. Roddy, chief, plant protection service, Boston Ordnance District, gave a coffee talk entitled "Plant Protection".

Morris Cohen, technical chairman, introduced F. Lloyd Woodside of Climax Molybdenum Co., who spoke on "Heat Treatment of Molybdenum High Speed Steels".

Mr. Woodside's talk covered the general compositions of the molybdenum-tungsten, molybdenum-vanadium, and tungsten-molybdenum high speed steels, and contained many practical suggestions for forging, annealing and hardening. He followed these instructions with special suggestions for atmosphere control and protective coatings.

He showed a representative group of lantern slides covering various tools such as slitting saws, profile cutters, broaches and spot facers. Included were samples of molybdenum-cobalt-boron tools which were cast and heat treated to as high as Rockwell C-71.

Under the able direction of Dr. Cohen, the discussion of Mr. Woodside's paper was stimulated by a board of four experienced men.

Miles Smith discussed molybdenum high speed steels from the manufacturer's viewpoint. He was followed by Gordon Wheeler who discussed furnace atmospheres. E. L. Bartholomew, who was one of the pioneer users of molybdenum high speed steels in the New England district, gave the benefit of his experiences and Bob Rose discussed decarburization and outlined the role of vanadium.

### Calumet Has President's Night

Reported by Edward Troy

Metallurgist, Inland Steel Co.

Calumet Chapter—National President's Night was celebrated at the opening meeting when Dr. O. E. Harder, national president of the A. S. M. and assistant director of Battelle Memorial Institute, spoke on "Alloys, Their Makeup and Industrial Importance".

Dr. Harder discussed the composition, properties and uses of a series of alloys. He dealt particularly with stainless steels and bearing alloys.

## Mo Steels Are Standardized In Three Types

Reported by B. A. Rogers

Supervising Engineer, Metallurgy of Steel Section, U. S. Bureau of Mines

Pittsburgh Chapter—In his opening remarks at the meeting on Oct. 9, Chairman L. C. Whitney announced that three members of the Chapter particularly familiar with molybdenum high speed steels were available for consultation without obligation by those not familiar with this type.

J. P. Gill then introduced the speaker, L. S. Bergen, associate director of metallurgy and research of the Crucible Steel Co. of America, whose topic was "Molybdenum High Speed Steels".

Mr. Bergen outlined briefly the historical development of high speed tool steels. Interest in the molybdenum high speed steels revived during the first World War as a result of the shortage of tungsten then experienced, and a variety of compositions are in current use.

Recently, the Office of Production Management standardized on three types which were classified by the speaker as:

M—A straight molybdenum steel containing no tungsten.

MLT—A molybdenum, low tungsten steel containing about 9% molybdenum plus a percent or two of tungsten.

MT—A steel containing molybdenum and tungsten in nearly equal proportions.

Mr. Bergen mentioned six major requirements that a good high speed steel must meet under present conditions. First, the steel must lend itself to volume production; second, it must have a reasonably wide, safe hardening range; third, it must cut well; fourth, it must be suitably tough; fifth, it must not decarburize excessively during heat treatment; and sixth, it must be available from several sources of supply. He then explained why each factor was important.

The immediately important part of the lecture dealt with details of heat treatment of the molybdenum high speed steels. The speaker spoke favorably of the interrupted quenching procedure in which the tool is quenched first in oil or a salt bath to, perhaps, 1000° F., and then allowed to finish cooling in air. He also recommended a double tempering treatment.

Slides were shown to illustrate the structural changes that occur during the tempering operations. Typical transformation curves were also thrown on the screen during the discussion of the effect of heat treatment.

The discussion period presided over by Mr. Gill brought out a number of additional facts concerning the treatment of such steels.

### Thum Addresses Saginaw

Reported by J. H. Loree

Metallographer, Chevrolet Motor Car Co.

Saginaw Valley Group—At the opening meeting on Oct. 28, 168 members of the Saginaw Valley Group of the Detroit Chapter turned out to hear Ernest E. Thum, editor, METAL PROGRESS, talk on "Strategic and Critical Metals".

Comparing both civilian and military requirements, Mr. Thum gave detailed information on supplies of all the scarce metals.

Paul W. Rhame, works manager, A. C. Spark Plug Co., also spoke, giving a very interesting account of the problems confronting an automotive plant in changing over to the production of 50-calibre machine guns.

### History of Westinghouse Ordnance Plant Recounted

Reported by J. M. Gotshall

Assistant Chief Chemist  
The Timken Steel and Tube Division

Canton-Massillon Chapter—At the meeting on Oct. 16, the first of the indoor season, the opportunity was taken to welcome the Westinghouse Electric and Manufacturing Co. personnel who operate the Naval Ordnance Plant in Canton.

Roy V. Gavert, manager of the plant, was the principal speaker of the evening. He talked on the history of the Westinghouse organization and the purposes behind the locating and building of the plant in this area, and the initiative of the Westinghouse organization in offering their services to the Government in the nation's defense program.

Following Mr. Gavert's talk, the group was entertained by Luke Barnett of Akron, Ohio, whose unique program caused much comment.

A buffet lunch rounded out the evening's program, attendance being about 135 members and guests.

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# Nitrided Steels Have Definite Applications For Industrial Use

Reported by G. L. White  
Editor, Canadian Metals & Metallurgical Industries

Ontario Chapter—V. O. Homerberg, Massachusetts Institute of Technology, discussed "Nitriding and Its Industrial Applications" at a record meeting at the Leonard Hotel, St. Catharines, on Sept. 19.

The steels commonly used in nitriding are of special composition known as Nitralloy, all containing aluminum. There is little to be gained by using more than 1.25% aluminum, and specifications usually require 0.90 to 1.40%.

In nitriding at the usual temperature of 975° F., distortion and changes in dimensions are very slight. Parts are heat treated and machined before nitriding.

Nitralloy, heat treated to a sorbitic structure, exhibits the same structure after nitriding with the possible exception of some evidence of a nitride network at the edge. A very thin iron-nitride layer on the surface gives maximum resistance to corrosion, but should be removed for maximum hardness and mirror finish.

A certain growth may take place during nitriding but once the growth characteristics are determined, the results can be reproduced and any allowance required can be made in the dimensions of the machined part prior to treatment.

Nitrided steels are sometimes used for their high hardness alone (1000 to 1200 Vickers), as in certain textile applications to resist abrasion by textile fibres. There are other applications where high hardness is required in combination with minimum distortion. In a third case, typified by crankshafts, elimination of distortion is the primary requirement, with hardness secondary.

Retention of hardness at elevated temperatures is a property of the highest importance in certain defense applications where metal-to-metal contact without lubrication may generate very high temperatures. A good instance of the combination of abrasion and corrosion resistance is the use of nitrided steel for a fluting roll for making corrugated paper.

Another important characteristic of nitriding is its ability to increase the endurance limit of parts which are subject to repeated stress or fatigue.

An interesting coffee talk and movie by Ellwood Jones, Gillies Guy Coal Co., Hamilton, explained anthracite mining in Pennsylvania.

## 250-Ton Forgings Must Be Handled With Care

York Chapter—Seventy-five persons attended the annual Waynesboro meeting on Oct. 8.

After the dinner and business meeting, A. O. Schaefer, engineer of tests, The Midvale Co., Philadelphia, presented a talk on "Large Forgings and Their Heat Treatment".

With the aid of slides, Schaefer showed how steel ingots are poured and later forged into shape. These ingots weigh as much as 250 tons each and it sometimes requires the metal from three open-hearth furnaces to pour each one.

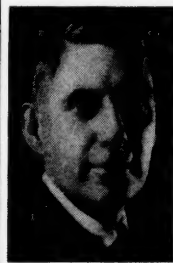
The ingots are reduced in size in the forging operation by means of a large press of 1000 tons capacity.

Great care must be exercised in forging, heat treating and machining as the finished product must be free from injurious defects and the metal must meet rigid physical specifications.

Gordon G. Vink of the Landis Machine Co. presided at the meeting.

# HERE AND THERE WITH A.S.M. MEMBERS

THE SAUVEUR Achievement Award for 1941 was presented on Oct. 23 on the occasion of the Annual Banquet of the American Society for Metals to ALBERT L. MARSH, president and general manager of the Hoskins Mfg. Co., Detroit.



A. L. Marsh

when with the Chicago Storage Battery Co.

His next position was with the firm of Mariner and Hoskins, consulting chemists, and it was here that his thoughts turned to the idea of a resistance alloy. His first patent for an electrical resistance element (the basis of the well-known Chromel-Alumel thermocouple) was granted in 1906.

Mr. Marsh was instrumental in organizing the Hoskins Mfg. Co. in 1908, of which he was named chief engineer and a director. He soon became superintendent and has been general manager since 1914 and president since 1932.

INVESTIGATIONS in metallurgy, particularly the foundry practice of gray cast iron will be the field of PHILIP C. ROSENTHAL who has joined the research staff of Battelle Memorial Institute, Columbus, Ohio.

Prior to his association with Battelle, Mr. Rosenthal was for four years on the faculty of the department of metallurgy, University of Wisconsin, from which school he received degrees of B. S. and M. S. in metallurgical engineering.

He is a member of the A.S.M., Sigma Xi, and the Committee on Classification of Graphite Flakes in Cast Iron of the American Foundrymen's Assoc.

NORMAN P. GOSS has been appointed a research engineer of American Steel & Wire Co., in Cleveland.

A graduate of Case School of Applied Science, Mr. Goss joined the General Electric Co. in 1925 where he engaged in X-ray diffraction investigation of metals. From 1927 to 1930 he was with American Steel & Wire Co.

In the meantime Mr. Goss had received the degree of Master of Science from Case School, and for the next year he attended the graduate school at the University of Illinois, specializing in mathematical physics. In 1932 he

## Navy Needs Engineers!

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joined the Cold Metal Process Co., Youngstown, Ohio, where he continued his X-ray work and metals research.

Mr. Goss holds a number of patents on strip steels such as light gage high strength tinplate and low alloy high strength strip steels.

ANOTHER award presented at the A.S.M. Banquet was the Henry Marion Howe Medal for the paper of highest merit published by the Society during the preceding year.

Winners of this honor were MARCUS



Howe Medalists Grossmann (Left), Asimow and Urban

A. GROSSMANN, director of research, Carnegie-Illinois Steel Corp.; MORRIS ASIMOW, manager, Central Metal Products Co.; and STEPHEN F. URBAN, metallurgist, South Works, Carnegie-Illinois Steel Corp.; for their paper on "Hardenability, Its Relation to Quenching, and Some Quantitative Data" published in the 1938 symposium on "Hardenability of Alloy Steels".

MARCUS A. GROSSMANN received his bachelor's degree from M.I.T. and his doctorate from Harvard. His metallurgical experience is wide and varied and includes several years with Republic Steel Co. and its subsidiaries before he joined Illinois Steel Co. in 1931. Since 1935 he has been director of research for Carnegie-Illinois.

He was Campbell Memorial Lecturer in 1930, is a consistent contributor to

A.S.M. technical programs and activities and is the author of a best-selling book on "Principles of Heat Treatment".

MORRIS ASIMOW was formerly associated with Dr. Grossmann as research metallurgist in the Gary Works of Carnegie-Illinois Steel Corp., but in the past year has been manager of Central Metal Products Co., Los Angeles.

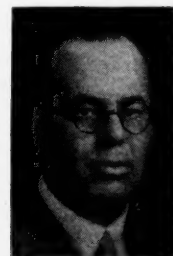
Born in Milwaukee, he attended University of California, where he received his B.S. in 1927, M.S. in 1932, and Ph.D. in 1934.

STEPHEN F. URBAN is a product of University of Michigan's Department of Engineering Research, where he was research assistant while working on his Ph.D. He also has a B.S. in chemical engineering from University of Michigan in 1930 and an M.S. in physics in 1932. He is metallurgist at Carnegie-Illinois' South Works.

A. H. d'ARCAMBAL, sales manager of the small tool and gage division, and consulting metallurgist for Pratt & Whitney Division of Niles-Bement-Pond Co., has been elected a vice-president.

Mr. d'Arcambal is a past national president of the A.S.M. and a past chairman of the Hartford Chapter.

He was born in Kalamazoo, Mich. in 1890, and following graduation from the engineering department of the University of Michigan, was for five years connected with various automotive concerns in the Detroit district. For two years before joining Pratt & Whitney in 1919, he was with Wright-Martin Aircraft as chief metallurgist.



A. H. d'Arcambal

## Employment Service Bureau

Address answers care A. S. M., 7301 Euclid Ave., Cleveland, unless otherwise stated

### Positions Open

TECHNICAL GRADUATE: Mechanical or metallurgical; five or more years experience in forming and rolling of metals; to devote efforts toward designing dies, forming blocks, etc. in aircraft industry. Permanent position in a newly erected research laboratory on the west coast. Write giving full details, stating salary expected. Box 11-5.

METALLURGIST: New York State manufacturer wants a man thoroughly trained in metallurgical engineering for a permanent position. Prefer man who is familiar with both ferrous and non-ferrous materials. Experience in carburizing and heat treating of steels essential. State full experience and salary expected in first letter. Correspondence will be kept confidential. Box 11-10.

SUPERVISOR: For heat treating department of tool parts manufacturer. Department carries great variety of work using 12 modern furnaces and two flame hardening machines. Excellent opening for man with technical background in either metallurgy or mechanical engineering experience in heat treating. Southern Ohio. Box 11-15.

UNIVERSITY GRADUATE in metallurgy: At least one year's experience in metallurgical department of modern foundry. For non-ferrous foundry in east. Salary \$40 to \$50 per week. Box 11-50.

Large manufacturer in Buffalo, N. Y., area now taking applications for the following positions in new modern laboratory: Write, giving personal details, experience, education, references, salary desired. Box 11-20.

SPECTROGRAPHER: Experienced in quantitative work on alloys.

NON-FERROUS CHEMIST: Experienced in analysis of brass, bronze, bearing metals, aluminum and magnesium alloys.

PHYSICAL TESTER: Qualified as supervisor of tensile, hardness, impact, fatigue, Magnaflex, and hardenability tests.

METALLOGRAPHER: Experienced on ferrous and non-ferrous materials; also macro etching, photography, report writing.

X-RAY TECHNICIAN: Experienced in radiography of castings, bearings, etc.

### Positions Wanted

EXECUTIVE ENGINEER: 28 years experience as superintendent, works manager, vice-president and consulting engineer, development engineer, etc., with large manufacturing companies. Particularly well fitted to design, build and manage ferro-alloy operations. United States citizen but at present employed in Canada. Salary desired \$500 per month. Box 11-25.

METALLURGIST-SUPERVISOR: M.S.E. degree. Several years experience of a supervisory nature in laboratory research and application of S.A.E. steels. Desires position as director of laboratory. Available on short notice. Box 11-30.

METALLURGIST: 30 years of age, married. Five years experience in heat treating and manufacture of tools; experienced in tool steels, especially molybdenum high speed steels. Knowledge of induction hardening; competent in physical testing, laboratory control, and metallography. New England region preferred. Box 11-35.

CHEMIST AND METALLURGIST: Age 49, family, B.S., University of Michigan, 1914. 27 years experience as chief chemist, chief metallurgist and technical research manager in rolling mill, machine tool, automotive, aircraft and office equipment industries. Box 10-25.

METALLURGICAL ENGINEER: Technical graduate; ten years experience in iron and steel including melting, casting, rolling, centrifugal casting, heat treating, testing and research. Experience includes responsible engineering production and development work. Capable of training men, organizing operations, and scheduling production. Box 11-40.

GRADUATE CHEMIST: Age 30, married. Experienced in steel mill chemical, metallographic, inspection, and physical testing work. Some familiarity with galvanizing and corrosion research, also brass and aluminum analysis. Competent to install and supervise chemical and metallurgical department. Available on 30 days' notice. Box 11-45.

METALLURGICAL ENGINEER: Degree received in 1940. Experience in general inspection; now employed by Federal Government. Desires to get into metallurgical field. Box 11-55.

## Pluramelt Process For "Armored" Steel Viewed & Explained

Reported by Forrest R. Nagley  
Associate Engineer, Navy Department

Washington Chapter—The 1941-42 season was opened with a dinner meeting at which R. K. Hopkins of the Allegheny Ludlum Steel Corp. discussed the "Pluramelt" process.

The meeting began with the showing of a morale-building movie entitled "There's A Job To Be Done" filmed at various plants of the Allegheny Ludlum Steel Corp. The movie presented, in striking emphasis, the importance of the steel industry in the national defense program.

Mr. Hopkins explained that engineering efforts to fuse two or more metals selected for particular properties, such as corrosion resisting steel on high tensile steel, began with the development work of the M. W. Kellogg Co. in connection with the "Kelcaloy" process for lining pressure vessels with corrosion and heat resisting alloys.

### Spot and Tack Welding Used

The merits and limitations of accomplishing the fusion by means of spot welding and tack welding as employed in the parent processes, had been the guiding fundamentals in the evolution of the present Pluramelt process.

Mr. Hopkins then continued his lecture with the aid of movies showing the melting equipment, the "armored" ingot produced by melting the alloy against one or more faces of a plain carbon steel slab, the blooming and rolling of the "armored" steel, and many of the physical tests designed to prove the integrity of fusion between the two metals and the merits of Pluramelt products.

The meeting concluded with an interesting discussion period in which many practical points were brought out.

## CHAPTER CALENDAR

| CHAPTER              | DATE    | PLACE                                      | SPEAKER            | SUBJECT  |
|----------------------|---------|--|--------------------|--|
| Boston               | Dec. 5  |  | B. Clements        | Aircraft Engine Materials  |
| Buffalo              | Dec. 11 | Hotel Buffalo                              | P. V. Faragher     | Aluminum Alloys  |
| Calumet              | Dec. 9  | Woodmar Country Club                       | F. F. Vaughn       | Induction Hardening  |
| Canton-Mass.         | Dec. 11 |  | F. F. Lucas        | High Power Metallurgy  |
| Chicago              | Dec. 11 | Chicago Bar Assoc.                         | Major W. B. Hobbs  | Women and the War  |
| Cincinnati           | Dec. 11 |  | Bradley Stoughton  | National Officers Night  |
| Cleveland            | Dec. 1  | Cleveland Club                             | Sam Tour           | Furnace Atmospheres for Heat Treatment of Tools and Special Steels |
| Columbus             | Dec. 10 | Ft. Hayes Hotel                            | Bradley Stoughton  | National Officers Night  |
| Dayton               | Dec. 12 | Engineers Club                             | Bradley Stoughton  | National Officers Night  |
| Detroit              | Dec. 8  | Sak's Inn                                  |                    | Christmas Party  |
| Golden Gate          | Dec. 12 | Leamington Hotel, Oakland                  |                    | Christmas Party  |
| Indianapolis         | Dec. 15 | Washington Hotel                           | R. M. Burns        | Protective Coatings  |
| Lehigh Valley        | Dec. 5  |  | G. V. Luerssen     | Heat Treatment of Alloy Steels                                     |
| Milwaukee            | Dec. 16 | Athletic Club                              | W. G. Hildorf      | Practical Applications of Physical Metallurgy                      |
| Montreal             | Dec. 1  | Windsor Hotel                              | Donald J. Reese    | Cupola Operation   |
| New Haven            | Dec. 11 | Hotel Barnum, Bridgeport                   | T. Holland Nelson  | Some Interesting Aspects of Welding                                |
| New Haven            | Dec. 19 | Seven Gables Inn, Milford, Conn.           |                    | Christmas Party  |
| New York             | Dec. 8  | Building Trades Club                       | Col. H. F. Safford | Manufacture of Guns  |
| North West           | Dec. 15 | Coffman Memorial Union, Univ. of Minn.     | John L. Burns      | Hardenability  |
| Northwest. Pa.       | Dec. 11 | Titusville, Pa.                            | C. H. Jennings     | Metallurgical Problems in Welding                                  |
| Notre Dame           | Dec. 10 | Engineering Audit, Univ. of Notre Dame     | C. A. Zapffe       | Hydrogen in Iron and Steel   |
| Ontario              | Dec. 5  | Toronto                                    | W. H. Oldacre      | Machinability of Metals as Affected by Cutting Fluids              |
| Oregon               | Dec. 12 |  |                    | Christmas Party  |
| Peoria               | Dec. 8  |  | G. L. Clark        | Industrial Application of Applied X-Rays                           |
| Philadelphia         | Nov. 28 | Engineers Club                             | T. S. Fitch        | Composite Steel  |
| Pittsburgh           | Dec. 11 |  |                    | Christmas Party  |
| Rhode Island         | Dec. 3  | Providence Engineering Society             | J. T. Beard        | Relation of Built-up Edge to Tool Life, Finish, and Cutting Oils   |
| Rochester            | Dec. 8  | Lower Strong Audit, U. of R. River Campus  | Stanley Watkins    | Practical Metallurgy of Stainless Steel                            |
| Rockford             | Nov. 26 |  | Walter Crafts      | Alloying Elements in Steel   |
| Rocky Mtn.           | Dec. 19 | Oxford Hotel                               |                    |  |
| Saginaw Valley Group | Dec. 5  | Herman Fischer's Hotel, Frankenmuth, Mich. |                    | Stag Party   |
| Schenectady          | Dec. 9  | Rensselaer Polytech.                       | A. V. de Forest    | Measurements Under Impact Conditions                               |
| Springfield          | Dec. 15 | Sheraton Hotel                             | Carl T. Hewitt     | Carburizing  |
| St. Louis            | Dec. 19 | York Hotel                                 |                    | Christmas Party  |
| Syracuse             | Dec. 2  | Onondaga Hotel                             | R. B. Lewis        | Testing  |
| Tri-City             | Dec. 9  | Hotel Fort Armstrong, Rock Island, Ill.    | A. S. Jameson      | Bolts—Materials, Treatment, Properties                             |
| Worcester            | Dec. 17 | Sanford Riley Hall, Wor. Polytech. Inst.   | W. L. Davis        | Aluminum Bundles for Britain                                       |
| York                 | Dec. 10 | Manufacturers Association Bldg.            | Edward J. Brady    | Welding Stainless Metals   |

## Speaks on Metallurgy Of Non-Ferrous Defense

Reported by Colin G. Chisholm  
Salesman, Columbia Steel Co.

Oregon Chapter—A series of sound pictures prepared by the Carboly Co., Inc., entitled, "The Grind's the Thing", were shown at the meeting on Sept. 19. These pictures were shown by the local representative of the Carboly Co., who then passed around for inspection a number of Carboly bits.

Chairman Thomas then introduced Ralph L. Phelps, San Francisco district manager, Bridgeport Brass Co., who spoke on "Metallurgy of the Non-Ferrous Defense Program".

Mr. Phelps' talk contained many detailed and pertinent figures for present distribution of the non-ferrous metals in relation to the defense program, the complexities that have arisen because of priorities, and the steps that have been and are being taken by the industry to meet the increasingly heavy demands.

## Consumption of Molybdenum Tripled in 2 Years

Reported by E. J. Wellauer  
Metallurgist, Falk Corp.

Milwaukee Chapter—The September meeting started off with a very successful coffee talk on the "Miracle of Light" by A. A. Engelhard of the Wisconsin Electric Power Co.

Edward R. Young of Chicago, metallurgical engineer, Climax Molybdenum Co. of Mich., presented the technical address of the evening.

The recent rapid increase in the use of molybdenum is indicated by the rise in domestic consumption from 9,000,000 lb. contained molybdenum in 1939 to an estimated 27,000,000 lb. in 1941.

A review of the status of molybdenum in the present emergency indicated that besides the well-known substitution of molybdenum for tungsten in high speed tool steels, chromium-molybdenum steels are replacing nickel-bearing steels.

It was predicted that manganese-molybdenum and manganese-molybdenum-vanadium steels will successfully serve in the event that chromium becomes scarcer. A still wider field will be found for carbon-molybdenum steels.

Increased attention to deoxidation procedures affecting hardenability can be expected as alloys become more scarce. These methods will be of definite assistance in securing the most from our supply of alloys and in applying the less highly alloyed steels to which we may later be restricted.

## Group Hears Latrobe Men

Reported by Herman J. Van Zyl  
Keeler Brass Co.

Grand Rapids Group—At the first meeting held Sept. 22 a very interesting and informative address was given by L. C. Grimshaw, metallurgist in charge of production for the Latrobe Electric Steel Co., on "Molybdenum High Speed Steels". He described six of the basic types and compared them to the tungsten varieties.

Ray P. Kells, metallurgist in charge of heat treating for Latrobe, led the discussion period.

## TWO NEW BOOKS

You Will Want to Add  
to Your Reference Shelf

### WHAT STEEL? SHALL I USE?

by Gordon T. Williams, Metallurgist,  
Deere & Co., Moline, Ill.

A book on selection of steels for manufacturing purposes based on a series of lectures given before the Tri-City Chapter A.S.M., many of which have been printed in recent issues of Metal Progress.

The great interest shown in the series and the many demands for reprints for use by various schools in educational courses prompted preparation of the lectures in book form.

Covers: selection of steels as affected by tensile properties; selection of steels as affected by endurance limit; impact and hardness tests; notes on their practical use; wear, and what can be done about it; metallurgical factors in the selection of steels; properties of steel as purchased; the available heat treating equipment; what alloy should be used; utility of casehardening steels; considerations in fabrication; economics; problems and service failures.

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### ALLOY CONSTRUCTIONAL STEELS

by H. J. French, In Charge of Alloy  
Steel and Iron Development,  
International Nickel Co.

Mr. French's lectures on "Alloy Constructional Steels" were so well received at the 1941 Western Metal Congress that they are being made into book form.

This 275-page book covers alloys in commercial steels—why alloy steels are used—selection of alloy steels—typical commercial uses—commercial steels and manufacturing variables—high alloy steels—wear—how alloying elements may affect corrosion of steels—processing and special treatments.

In a time when much of our steel is being used for construction, the valuable information contained in this book is particularly important and timely. Reserve your copy today.

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Cloth binding ... \$4.00

### STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of THE REVIEW, published monthly except July and September at Cleveland, Ohio, for October 1, 1941, State of Ohio, County of Cuyahoga, ss. Before me, a Notary Public, in and for the State and county aforesaid, personally appeared Ray T. Bayless, who, having been duly sworn according to law, deposes and says that he is the Editor of THE REVIEW of the American Society for Metals, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations to wit:

1.—That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, American Society for Metals, 7301 Euclid Ave., Cleveland, O.; Editor, Ray T. Bayless, 7301 Euclid Ave., Cleveland, O.; Managing Editor, M. R. Hyslop, 7301 Euclid Ave., Cleveland, O.; Business Manager, Ray T. Bayless, 7301 Euclid Ave., Cleveland, O.

2.—That the owner is: The American Society for Metals, 7301 Euclid Ave., Cleveland, O., which is an educational institution, the officers being: President, Oscar E. Harder; Vice-President, Bradley Stoughton; Treasurer, Kent R. Van Horn; Secretary, W. H. Eisenman; Trustees: H. J. French, M. A. Grossmann, E. L. Bartholomew, C. Y. Clayton, James P. Gill. All officers as above, 7301 Euclid Ave., Cleveland, Ohio.

3.—That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4.—That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

Ray T. Bayless, Editor.

Sworn to and subscribed before me this 1st day of October, 1941.

(Seal) Arthur T. Wehrle, Notary Public. (My commission expires Jan. 20, 1944.)



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